AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A computer-implemented method for approximating a <u>general base logarithm</u> function of an input argument <u>X</u>, comprising:

selecting one of a plurality of breakpoints, such that a reduced argument for the function is less than a predetermined value; and

evaluating an approximate function of the reduced argument, including accessing a look-up table based on the selected breakpoint to obtain a value of a term in the approximate function,

wherein the look-up table has at least one breakpoint for which the reduced argument is computed without roundoff error when the input argument is close to a root of the function.

2. (Canceled).

3. (Currently Amended) The method of claim ~~2~~ <u>1</u> further comprising:

representing X in the floating point form Y^*G^k where Y is greater than or equal to 1 and G is a positive integer larger than Y, and wherein the reduced argument is $Z=C^*(Y^*B_j-1)$ where Bj is any of the plurality of breakpoints and C is a function of $\log_b(e)$, and evaluating the approximate function includes determining $\log_b(1/B_j)$ using the look-up table and determining $\log_b(X)$ as an arithmetic combination of at least $k^*\log_b(2)$, $\log_b(1/B_j)$, and $\log_b(1+Z/C)$.

4. (Previously Presented) The method of claim 3 wherein Y is equal to or less than 2 and the look-up table is modified such that $B_0=1$ and $B_N=1/2$.

5. (Original) The method of claim 3 wherein $\log_b(1/B_j)$ is given by the look-up table as at least two lower precision values $T_{j,hi}$ and $T_{j,lo}$ whose sum equals $\log_b(1/B_j)$, $\log_b(2)$ is given by at least two lower precision values L_{hi} and L_{lo} whose sum equals $\log_b(2)$, and Z is given by at least two lower precision values Z_{hi} and Z_{lo} whose sum equals Z.

6. (Original) The method of claim 5 wherein $\log_b(X)$ is approximated by $A_1+A_2+Z_{lo}$, where A_1 is $k^*L_{hi}+T_{j,hi}+Z_{hi}$, A_2 is $k^*L_{lo}+T_{j,lo}+P$ and P is $\log_b(1+Z/C)-Z$.

7. (Original) The method of claim 6 wherein if $k*N+j=0$ for the breakpoint, then $\log_b (X)$ is approximated by $(A_1+Z_{lo})+A_2$.

8. (Original) The method of claim 7 wherein $\log_b (X)$ is otherwise given by $A_1 + (A_2+Z_{lo})$.

9. (Original) The method of claim 3 wherein the predetermined value is proportional to $1/(2*N)$.

10. (Original) The method of claim 9 wherein $k*L_{hi}+T_{j,hi}$ can be represented without roundoff error for all valid values of k,j.

11. (Original) The method of claim 10 wherein $T_{0,hi}=T_{0,lo}=0$ and $T_{N,hi}=L_{hi}$, $T_{N,lo}=L_{lo}$.

12. (Previously Presented) An article of manufacture, comprising:

a machine readable medium having instructions stored therein that can be executed by a processor to approximate a function of an input argument X by selecting one of a plurality of breakpoints, such that a reduced argument for the function is less than a predetermined value, and evaluating an approximate function of the reduced argument including accessing a look-up table based on the selected breakpoint to obtain a value of a term in the approximate function, wherein X is in the floating point form $Y*G^k$ where Y is between 1 and 2 and G is a positive integer larger than Y, and wherein the look-up table is such that breakpoint $B_0=1$ and breakpoint $B_N = 1/2$.

13. (Original) The article of manufacture of claim 12 wherein the function is $\log_b(X)$.

14. (Previously Presented) The article of manufacture of claim 13 wherein the medium has further instructions for representing the reduced argument as $Z=C*(Y*B_j-1)$ where Bj is any of the plurality of breakpoints and C is a function of $\log_b(e)$, and evaluating the approximate function includes determining $\log_b(1/B_j)$ using the look-up table and determining $\log_b(X)$ as an arithmetic combination of at least $k*\log_b(2)$, $\log_b(1/B_j)$, and $\log_b(1+Z/C)$.

15. Canceled.

16. (Original) The article of manufacture of claim 13 wherein $\log_b (1/B_j)$ is given by the look-up table as at least two lower precision values $T_{j,hi}$ and $T_{j,lo}$ whose sum equals $\log_b (1/B_j)$, $\log_b (2)$ is given by at least two lower precision values L_{hi} and L_{lo} whose sum equals $\log_b (2)$, and Z is given by at least two lower precision values Z_{hi} and Z_{lo} whose sum equals Z.

17. (Original) The article of manufacture of claim 16 wherein $\log_b (X)$ is approximated by $A_1+A_2+Z_{lo}$, where A_1 is $k*L_{hi}+T_{j,hi}+Z_{hi}$, A_2 is $k*L_{lo}+T_{j,lo}+P$ and P is $\log_b (1+Z/C)-Z$.

18. (Original) The article of manufacture of claim 17 wherein if $k*N+j=0$ for the breakpoint, then $\log_b (X)$ is approximated by $(A_1+Z_{lo})+A_2$.

19. (Original) The article of manufacture of claim 18 wherein $\log_b (X)$ is otherwise given by $A_1 + (A_2+Z_{lo})$.

20. (Original) The article of manufacture of claim 14 wherein the predetermined value is proportional to $1/(2*N)$.

21. (Original) The article of manufacture of claim 20 wherein $k*L_{hi}+T_{j,hi}$ can be represented without roundoff error for all valid values of k,j.

22. (Original) The article of manufacture of claim 21 wherein $T_{0,hi}=T_{0,lo}=0$ and $T_{N,hi}=L_{hi}$, $T_{N,lo}=L_{lo}$.

23. (Currently Amended) A computer system comprising:

a processor coupled to a non-volatile storage device, the storage device contains instructions that when executed by the processor approximate a function of a number $\underline{X}$, by selecting one of a plurality of breakpoints $B_0>B_1>\ldots B_N$, such that a reduced argument for the function is less than a predetermined value, and evaluating an approximate function of the reduced argument including accessing a look-up table based on the selected breakpoint to obtain a value of a term in the approximate function, wherein ~~the look-up table has at least one of B_0 and B_N for which the reduced~~

~~argument is computed without roundoff error~~X is represented in the floating point form $Y*G^k$ where Y is greater than or equal to 1 and G is a positive integer larger than Y, and wherein the reduced argument is $Z=C*(Y*B_j-1)$ where Bj is any of the plurality of breakpoints and C is a function of $\log_b(e)$, and the approximate function is evaluated by determining $\log_b(1/B_j)$ using the look-up table and function of X is determined as an arithmetic combination of at least $k*\log_b(2)$, $\log_b(1/B_j)$, and $\log_b(1+Z/C)$, the predetermined value is proportional to $1/(2*N)$, $\log_b(1/B_j)$ is given by the look-up table as at least two lower precision values $T_{j,hi}$ and $T_{j,lo}$ whose sum equals $\log_b(1/B_j)$, $\log_b(2)$ is given by at least two lower precision values L_{hi} and L_{lo} whose sum equals $\log_b(2)$, and Z is given by at least two lower precision values Z_{hi} and Z_{lo} whose sum equals Z, $k*L_{hi}+T_{j,hi}$ can be represented without roundoff error for all valid values of k,j, and wherein $T_{0,hi}=T_{0,lo}=0$ and $T_{N,hi}=L_{hi}$, $T_{N,lo}=L_{lo}$.

24. (Original) The computer system of claim 23 wherein the function is $\log_b(X)$.

Claims 25-26 (Canceled).

27. (Currently Amended) The computer system of claim ~~26~~ 24 wherein $\log_b(X)$ is approximated by $A_1+A_2+Z_{lo}$, where A_1 is $k*L_{hi}+T_{j,hi}+Z_{hi}$, A_2 is $k*L_{lo}+T_{j,lo}+P$ and P is $\log_b(1+Z/C)-Z$.

28. (Previously Presented) The computer system of claim 23 wherein the processor has a hardware architecture that is pipelined.

29. (Original) The computer system of claim 28 wherein the processor is one of a plurality of IA-32 series of processors by Intel Corp.

30. (Previously Presented) A computer-implemented method for approximating a function of an input argument, comprising:

selecting one of a plurality of breakpoints, such that a reduced argument for the function is less than a predetermined value; and

evaluating an approximate function of the reduced argument, including accessing a look-up table based on the selected breakpoint to obtain a value of a term in the approximate function,

wherein the look-up table has at least one breakpoint for which the reduced argument is computed without roundoff error when the input argument is close to a root of the function by less than 2^{-9}.

31. (New) The method of claim 30 wherein the function being approximated is a general base logarithm function.

32. (New) A computer-implemented method for approximating a function of an input argument X, comprising:

selecting one of a plurality of breakpoints, such that a reduced argument for the function is less than a predetermined value;

representing X in the floating point form Y^*G^k where Y is greater than or equal to 1 and G is a positive integer larger than Y, and wherein the reduced argument is $Z=C^*(Y^*B_j-1)$ where Bj is any of the plurality of breakpoints and C is a function of $\log_b(e)$;

determining $\log_b(1/B_j)$ using a look-up table and evaluating the function at X as an arithmetic combination of at least $k^*\log_b(2)$, $\log_b(1/B_j)$, and $\log_b(1+Z/C)$;

wherein $\log_b(1/B_j)$ is given by the look-up table as at least two lower precision values $T_{j,hi}$ and $T_{j,lo}$ whose sum equals $\log_b(1/B_j)$, $\log_b(2)$ is given by at least two lower precision values L_{hi} and L_{lo} whose sum equals $\log_b(2)$, and Z is given by at least two lower precision values Z_{hi} and Z_{lo} whose sum equals Z;

wherein the function of X is approximated by $A_1+A_2+Z_{lo}$, where A_1 is $k^*L_{hi}+T_{j,hi}+Z_{hi}$, A_2 is $k^*L_{lo}+T_{j,lo}+P$ and P is $\log_b(1+Z/C)-Z$; and

wherein the look-up table has at least one breakpoint for which the reduced argument is computed without roundoff error when the input argument is close to a root of the function.